

II. Remarks

Reconsideration and re-examination of this application in view of the above amendments and the following remarks are respectfully requested.

Claims 1 and 13 have been amended. Claim 14 has been cancelled, and therefore the claim rejection of claim 14 under 35 U.S.C. § 112 is now moot. We acknowledge and appreciate the Examiner's renumbering of previously presented claims 16-25 as claims 15-24. Accordingly, after entering this amendment, claims 1-13 and 15-24 remain pending.

Claims 1 and 13 have been amended to more clearly define Applicant's invention. Specifically, amended claims 1 and 13 are each directed to a heat exchanger with a tube for conveying coolant. The tube has a flattened cross-section and two major opposing walls. The distance between the walls defines a width of the tube, and each wall is provided with projections that extend into the internal cross-sectional area less than 30% of the width of the tube. The area of the walls provided with the projections amounts to less than 7.5% of the total area of the walls.

The arrangement and size of the projections ensure that incoming laminar flow into the tube is diverted from wall to wall and from side to side between the tube walls to promote a substantially uniform temperature distribution throughout the tube to enhance the heat exchange performance of the tube. The size and arrangement of each projection also allows the flow to resume its laminar form before it encounters the next projection. Accordingly, although the flow is diverted around the projections, the flow remains generally laminar in form to reduce back pressure in the tube, minimizing resistance in the flow.

Claim Rejections under 35 U.S.C. § 102(b)

Claims 1-5, 9, 12, 13, 15-17, 21, and 24 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,730,213 to Kiser et al.

Kiser discusses a flattened cooling tube for heat exchangers. The tube has internal opposing walls provided with inwardly projecting dimples. In a preferred embodiment, the dimples are spaced laterally at intervals of approximately 0.375

inches from each other, and the longitudinal spacing between the dimples is approximately one inch. Kiser indicates that the dimples may extend to a depth of about 50% of the tube cross section, but does not indicate the dimples lateral dimensions. Therefore, it is impossible to determine the area of walls of the tubes covered by the dimples.

Thus, Kiser does not teach each and every limitation of amended claims 1 and 13. Accordingly, reconsideration and withdrawal of the rejections of claims 1 and 13 under 35 § 102(b) are respectfully requested.

Since claims 3-5, 9, 12, 15-17, 21, and 24 depend from claims 1 or 13, the reasons for allowance of claims 1 and 13 apply as well to the dependent claims.

Claim Rejections under 35 U.S.C § 103(a)

Claims 1-5, 9, 12, 13, 15-17, 21, and 24 have been rejected under 35 U.S.C. 103(a) as being obvious over Kiser. Claims 6-8, 10, 11, 18-20, 22, and 23 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Kiser and U.S. Patent No. 4,470,452 to Rhodes.

The Examiner contends that it is obvious to optimize the parameters of Kiser's dimples to arrive at the claimed invention. However, Kiser specifically states that purpose of the dimples is to enhance heat transfer from the coolant in the tube by causing "a turbulent fluid flow within the tube." (See, e.g., column 4, lines 57-58.) Kiser neither mentions nor suggests that the flow resumes laminar flow after the flow encounters each dimple such that the flow remains generally laminar in form. In sum, once turbulent flow is created in Kiser's tubes, the flow remains turbulent. Indeed, Kiser fails to appreciate the advantages of maintaining substantially laminar flow in the tube. Absent an appreciation of these advantages, there is no suggestion of a flattened heat exchanger tube with projections that extend into the cross-sectional area of less than 30% of the width of the tube, as required by amended claims 1 and 13. Moreover, there is no suggestion that the area of the walls provided with the projections amounts to less than 7.5% of the total area of the walls, as also required by claims 1 and 13.


Thus, Kiser cannot render Applicant's invention as claimed in claims 1 and 13 as obvious. Accordingly, reconsideration and withdrawal of the rejections of claims 1 and 13 under 35 § 103(e) are respectfully requested.

Since claims 2-13 and 15-24 depend from claims 1 or 13 and since Rhodes does not overcome the deficiencies of Kiser for at least the reasons stated above, the allowance of claims 1 and 13 apply as well to the dependent claims.

III. Conclusion

In view of the above amendments and remarks, it is respectfully submitted that the present form of the pending claims (Claims 1-13 and 15-24) are now in condition for allowance. The Examiner is invited to contact the undersigned attorney for the Applicant via telephone if such communication would expedite this application.

Respectfully submitted,



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